Abstracts

Gregory L. Moneta, MD, Section Editor

Atherosclerotic Plaque Composition and Occurrence of Restenosis After Carotid Endarterectomy

Hellings WE, Moll FL, De Vries JP, et al. JAMA 2008;299:547-54.

Conclusion: Lipid-rich inflammatory plaques are associated with a reduced risk of restenosis after carotid endarterectomy.

Summary: Both clinical and angiographic criteria have been used to try to determine the risk of restenosis after a vascular intervention. The authors of this study evaluated the composition of the atherosclerotic plaque at the intervention site in terms of plaque features that may be related to carotid restenosis after carotid endarterectomy. There were 500 patients prospectively followed up between April 1, 2002, and March 14, 2006. Patients were assessed for carotid artery restenosis as measured by duplex ultrasound imaging 1 year after intervention. A >50% stenosis was defined as a peak systolic velocity of >125 cm/s and a >70% stenosis was defined as a peak systolic velocity of >230 cm/s. Carotid restenosis after carotid endarterectomy was determined with predefined histologic plaque characteristics. These included macrophage and smooth muscle cell infiltration, collagen, calcification, interplaque hemorrhage, luminal thrombus, and lipid core size. Comparisons were determined using multivariate logistic regression analysis and were adjusted for clinical characteristics.

At 1 year, 85 patients (17%) had developed ≥50% carotid restenosis, and 40 (8%) developed ≥70% restenosis. Histologic examination of the plaque revealed that increased macrophage infiltration (n = 286) had a lower risk of ≥50% restenosis than plaques with no or minor macrophage infiltration (n = 215; 11.5% vs 24.3%; adjusted odds ratio [OR], 0.43; 95% confidence interval [CI], 0.26-0.72). Patients with higher macrophage infiltration also had a lower risk of developing ≥70% restenosis (4.5% vs 12.6%; adjusted OR, 0.36; 95% CI, 0.17-0.74). The 177 patients whose plaque had a lipid core that was >40% of plaque volume also had a lower risk of ≥50% restenosis than the 94 patients with a lipid core size of <10% (11.3% vs 25.5%; adjusted OR, 0.40; 95% CI, 0.19-0.81). A large lipid core also had a lower risk of developing ≥70% restenosis (5.6% vs 14.9%; adjusted OR, 0.42; 95% CI, 0.17-1.04).

Comment: Many of the findings of this study are unexpected. Plaque characteristics of inflammation and higher lipid content, commonly thought to be associated with more dangerous plaques were, in this study, associated with lower rates of restenosis after carotid endarterectomy. Their other findings also seem in opposition to previous studies or prevailing opinion. For example, an incidence of 21% of >50% restenosis with Dacron patch angioplasty at 1 year is higher than usually reported. Also, vein and Dacron patches are not generally regarded as having much difference in their ability to prevent restenosis after carotid endarterectomy, but this study found vein patches were more much effective in preventing restenosis than Dacron patches. The high incidence of restenosis in this study may be explained by the duplex characteristics for defining >50% and >70% internal carotid artery stenosis. The duplex parameters used are likely to be more sensitive than specific, thereby artificially elevating the incidence of carotid restenosis after carotid endarterectomy.

Anemia as an Independent Predictor of Perioperative and Long-term Cardiovascular Outcome in Patients Scheduled for Elective Vascular Surgery

Dunkelgrun M, Hoeks SE, Welten GM, et al. Am J Cardiol 2008;101:1196-200.

Conclusion: Preoperative anemia predicts an increased risk of 30-day and 5-year cardiac events, independent of underlying heart and renal disease.

Summary: The authors sought to determine whether anemia was an independent risk factor for adverse cardiac outcome in patients undergoing elective vascular surgery. This was a retrospective study where 1363 patients with known or suspected coronary artery disease were referred for testing before they underwent scheduled elective, noncardiac, open vascular surgery. The study took place at Erasmus Medical Center in the Netherlands from 1990 to August 2006. Preoperative testing included standard laboratory chemistries and complete blood counts as well as echocardiography and assessment of baseline clinical characteristics. A total of 152 patients were treated at another hospital and were excluded, leaving 1211 patients for analysis (77% men, 68 ± 11 years of age). Anemia was defined as a serum hemoglobin level <13 g/dL for men and <12 g/dL for women. Anemia levels were divided into tertiles: mild (men, 12.2-13.0 g/dL; women, 11.2-12.0 g/dL), moderate (men, 11.0-12.1 g/dL; women, 10.2-11.1 g/dL), and severe (men, 7.2-11.0 g/dL; women, 7.5-10.1 g/dL). Outcome measures were 30-day and 5-year major adverse cardiac events (MACE; myocardial infarction or cardiac death).

Analysis was performed with multivariable logistic and Cox regression techniques adjusting for cardiac risk factors, including heart failure and renal disease. Data are presented as hazard ratios (HRs), with 95% confidence intervals. There were 74 patients (6%) who had a 30-day MACE, and 199 patients (17%) had a 5-year MACE event. Anemia was detected preoperatively in 399 patients (33%): anemia was mild 133, moderate in 133, and severe in 133. Renal dysfunction, diabetes, and heart failure all were associated with anemia. After adjusting for clinical risk factors, 30-day HRs for a MACE per anemia group were 1.8 for mild (0.8-4.1), 2.3 for moderate (1.1-5.4), and 4.7 for severe (2.6-10.9) anemia. The 5-year HRs for a MACE per anemia group were 2.4 for mild (1.5-4.2), 3.6 for moderate (2.4-5.6), and 6.1 for severe (4.1-9.1) anemia.

Comment: Things are getting more complicated with respect to anemia in the perioperative period. On the one hand, we have information indicating transfusion probably increases surgical site infection and perioperative and late death. Conversely, studies such as this indicate anemia is a marker for early and late postoperative MACE. There is probably some correct information in both types of studies. Anemia is detrimental around the time of a vascular operation, but correcting it postoperatively may not help and perhaps makes things worse. There are likely many unrecognized confounding variables. Vascular surgeons should understand their anemic patients are at higher risk and that risk is not likely to be reduced by a liberal postoperative transfusion policy. Perhaps this makes it even more important in such patients to optimize perioperative β-blockers, antiplatelet, and statin medications.

Modeling the Long-term Cost-Effectiveness of Endovascular or Open Repair for Abdominal Aortic Aneurysm

Epstein DM, Sculpher MJ, Manca A, et al. Br J Surg 2008;95:183-90.

Conclusion: Endovascular aneurysm repair (EVAR) is not cost-effective.

Summary: EVAR has been shown in recent randomized trials to have a 3% aneurysm-related survival benefit compared with open surgery in patients who are suitable for both open and EVAR of an abdominal aortic aneurysm (AAA). EVAR has a high graft-related cost, a need for long-term follow-up, and an uncertain long-term outcome. This study used a decision model to estimate lifetime costs and quality-adjusted life-years with EVAR and open AAA repair in men aged 74 years. Risk of death from aneurysm-related causes, other cardiovascular causes, and noncardiovascular causes, as well as nonfatal cardiovascular events and reinterventions, were incorporated into the model. The patients were assumed to be 74 years old because this was the mean age of participants in EVAR-1. The measure of health benefit was expected quality-adjusted survival duration. All costs were measured in United Kingdom pounds based on 2004 pricing. Both health benefits and costs in future years were discounted at a rate of 3.5% per year. Most of the data used in the modeling was from the EVAR-1 trial, but it was supplemented by data from population tables, registries, and the Dutch Randomised Endovascular Aneurysm Management (DREAM) trial. Because both EVAR-1 and the DREAM trial found no late survival benefit, an increased risk of cardiovascular mortality was assumed in the EVAR-treated patients. This risk was varied in sensitivity analysis in the model.

Using base-case (primary assumptions), EVAR was found to cost £3800 (95% confidence interval [CI], £2400-£5200) more per patient than open repair. EVAR also produced fewer lifetime quality-adjusted life-years (mean, −0.020; 95% CI, −0.189 to 0.165) than open repair. The results remain sensitive to alternative model assumptions.

Comment: The data indicate, at least from the perspective of the National Health Service in the United Kingdom, that EVAR is unlikely to be cost-effective. The cost of EVAR is largely driven by the cost of the devices, which are ultimately, as the authors pointed out, under the control of the manufacturers. When all factors are considered, EVAR is not proving to be the "home run" that it was touted to be. At some point the cost of increasing medical technology is going to prove to be prohibitive. Both vascular surgeons and industry may be wise to be proactive in controlling costs of EVAR.

The Effect of Lower Targets for Blood Pressure and LDL Cholesterol on Atherosclerosis in Diabetes: The SANDS Randomized Trial

Howard BV, Roman MJ, Devereux RB, et al. JAMA 2008;299:1678-89.

Conclusion: Aggressive reduction of low-density lipoprotein cholesterol (LDL-C) and systolic blood pressure (SBP) can result in regression of